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the species. The sheaths may be persistent or deciduous; there may or may not be thorny leafless axillary branches; there may be short accessory leaf-bearing branches. In one extreme, the result is a leafy tangle or jungle of thorns, in which the main stems are almost invisible and quite unapproachable; in the other the perfectly smooth jointed stems bearing leaves only near the top. *Bambusa Blumena*, the common building material of the Philippine Islands, is of the former type, *Dendrocalamus giganteus* of the latter.

(To be continued)

SOME PLANTS FROM THE VICINITY OF THE ARAPAHOE GLACIER.

BY T. D. A. COCKERELL

Looking west from the town of Boulder, Colorado, up Boulder Canyon, the skyline is formed by the Arapahoe Peaks, with the highest summit some 13,500 feet above sea level. On the face of this mountain is a large white area, the Arapahoe glacier; now greatly reduced from its original size, but still a moving mass of ice. The glacier is at the end of a narrow valley, occupied by quantities of morainal matter, the successive deposits of which, crossing the valley, have given rise to a series of small lakes. The lakes or ponds near to the glacier are of a most beautiful green color, presumably due to the suspension of exceedingly fine particles, ground by the slowly moving ice. On the south side of the valley or gulch, extending eastward from the peaks, is an enormous upland area, in places very rocky, with one especially large rounded elevation known as Baldy Mountain. This region is all above timber line, with elevations of between 11 and 12 thousand feet. It is bounded below by the dense forests of the Hudsonian Zone, consisting mainly of Engelmann spruce. On July 24, 1915, the Arapahoe Peaks were visited by the summer school of the University of Colorado. Accompanying the expedition, I did not attempt to climb to the highest point, which offers nothing of botanical interest, but contented myself with exploring, as well as the time permitted, the elevations extending along the south side of the gulch,

including Mt. Baldy. In this I was assisted by Miss Anna Deacon of Iowa, whose keen eyes materially contributed to the success of the search.

Speaking broadly, the flora of these regions is well known; yet every visit seems to yield something worthy of note. I record here only a few of the more interesting plants we found.

1. *Silene acaulis* L. Extremely abundant, covering the ground with its moss-like growth in many places. Three forms, distinct at a glance, were found.

- (a) Typical, with larger flowers, about 10 mm. diameter; stamens long and anthers well developed, exposed; stigmatic branches at first short, later becoming elongated; (flowers protandrous).
 - (a¹) Flowers pink; the common form.
 - (a²) Flowers white, sometimes with a very faint pinkish flush.
- (b) Small flowers, about 6–6.5 mm. broad; the three stigmatic branches very long, protruding, fully as long as the petals; stamens short, concealed, with minute infertile anthers.

I supposed, at first, that I had two different species; growing intermixed, but each plant true to a single type. The floras of the region say nothing about dimorphism in the species, but in Knuth's Handbook of Flower Pollination, translated by Ainsworth Davis, Vol. II, the matter is fully explained, with figures after H. Müller.

2. *Papaver coloradense* Fedde. Growing among enormous rocks, quite common in one place. It is not in "The Flora of Boulder, Colorado, and vicinity" (1911), by Dr. F. P. Daniels, but Mr. D. M. Andrews had previously found it on the south slope of Arapahoe Peak. We found two color varieties in approximately equal numbers; (a) *typicum*; petals clear bright sulphur yellow; (b) *aurantiellum*, nov., petals dilute reddish-orange (apricot color), white at base, but the base beneath greenish yellow. Exactly the same color variation is found in the allied European plants. This is certainly the plant named by Fedde, but it may not be truly distinct from *P. radicum*. It is not "dense brunneo-setulosa," as Fedde describes; the calyx and upper part of peduncles are so, but the leaves are *sparsely* pale-hirsute. The peduncles of the orange variety are about 50 mm. long, leaves about 31 mm. of which about 13 mm. is blade.

3. *Primula angustifolia* Torrey. Exceedingly abundant on the higher slopes. Miss Deacon found a beautiful color-variety, with the corolla a clearer pink (not at all magenta or bluish-pink), a tint best described as bright rose-pink, the eye pale orange. The difference is doubtless due to greater acidity of the sap, not to any difference in the pigment itself. There are various intermediates, and very possibly the shade of color changes during the life of the flower, so it hardly seems advisable to give a varietal name.

4. *Primula parryi* Gray. In the midst of a hailstorm, as we hurried along, we were arrested by a truly magnificent sight, a large clump of bright *Primula* flowers, entirely different from the *P. angustifolia* growing all around. I thought I had a new species of *Primula*, for although I had several times met with *P. parryi*, it was always in the dense forests of the Hudsonian Zone, by streams, and growing at least twice as tall. This plant, with scapes about 80–90 mm. long; leaves about 80 mm. long, and 20–25 broad; calyx very dark red, densely glandular; corolla-lobes 11–13 mm. long, very bright purplish pink; growing out in the open far above timber line, looked very unlike true *P. parryi*. Nevertheless, on actual comparison later with fresh material of *parryi*, no doubt remained that we had found the same species, a growth-form affected by the conditions of the environment. For such a form a name is available, if required; *P. parryi* f. *mucronata* (*P. mucronata* Greene, Pittonia, III, 251). The apical mucro of the leaves is present in our plant, but there are also remote marginal mucrones or denticles, not mentioned by Greene. The outer leaves do not appear to be narrowed, as they are said to be in the Nevada plant. The round-topped flower clusters are characteristic. Greene remarked that *mucronata* grew "far above timber-line, among rocks and near snow."

5. *Eritrichium argenteum* Wight. Very abundant on the higher slopes. Two forms were observed:

- (a) Typical. Flowers 6.5 mm. broad (Wight measured 4–6 mm. in dry specimens) very bright blue.
- (b) Flowers 3.5–4 mm. broad, blue sometimes less bright.

The first is the common form.

Last year Mr. E. Bethel found a white-flowered form (*albi-
orum*, nov.) below the glacier.

The continued observation of variations in plants, in different parts of the world, brings out the fact that these are (unless environmental) almost always due to the shuffling or loss of genes which are themselves of great antiquity. Thus the comparative study of minor differences becomes increasingly important for the understanding of the origin of species, as well as for horticulture. With our greatly increased knowledge of the processes of heredity, we can now go into the field and interpret our observations in ways formerly impossible, so that the study of variation becomes increasingly fruitful.

In Europe the minute study and taxonomic treatment of plant-variation has been carried to extremes unknown in this country. The European literature in large part needs reinterpretation in the light of genetic research, but it affords an invaluable basis for comparisons.

PLEISTOCENE PLANTS FROM INDIAN HEAD, MARYLAND.

BY EDWARD W. BERRY

About a year ago I received a small collection of plant remains from Mr. Geo. B. Lloyd who collected them at the bottom of a dug well at Indian Head in Charles County, Maryland. The well is in the Talbot formation and is located near the 20-foot contour on the northern edge of the valley of Mattawoman Creek.

The materials passed through in the digging of the well, as reported by Mr. Lloyd, are as follows:

	Feet
Yellow clay.....	10
Fine yellow sand.....	12
Gravel.....	9
Blue clay with vivianite.....	10
Bluish sandy clay with leaves.....	1½

A considerable flora has previously been recorded from the Pleistocene of Maryland, the interest in the present small collection consisting in the clearly indicated changes of level since